```
In [1]: import numpy as np
        import pandas as pd
        import sympy as sym
        import matplotlib as pyplot
        from matplotlib import pyplot
```

```
In [2]: def objective(x):
            return (x+3)**2
```

```
In [3]: def derivative(x):
            return 2*(x+3)
```

```
In [4]: def gradient(alpha,start,max_iter):
            x_list=list()
            x=start
            x_list.append(x)
            for i in range(max_iter):
                gradi=derivative(x)
                x=x-(alpha*gradi)
                x_list.append(x)
            return x_list
        x=sym.symbols('x')
        expr=(x+3)**2.0
        grad=sym.Derivative(expr,x)
        print("{}".format(grad.doit()))
        grad.doit().subs(x,2)
```
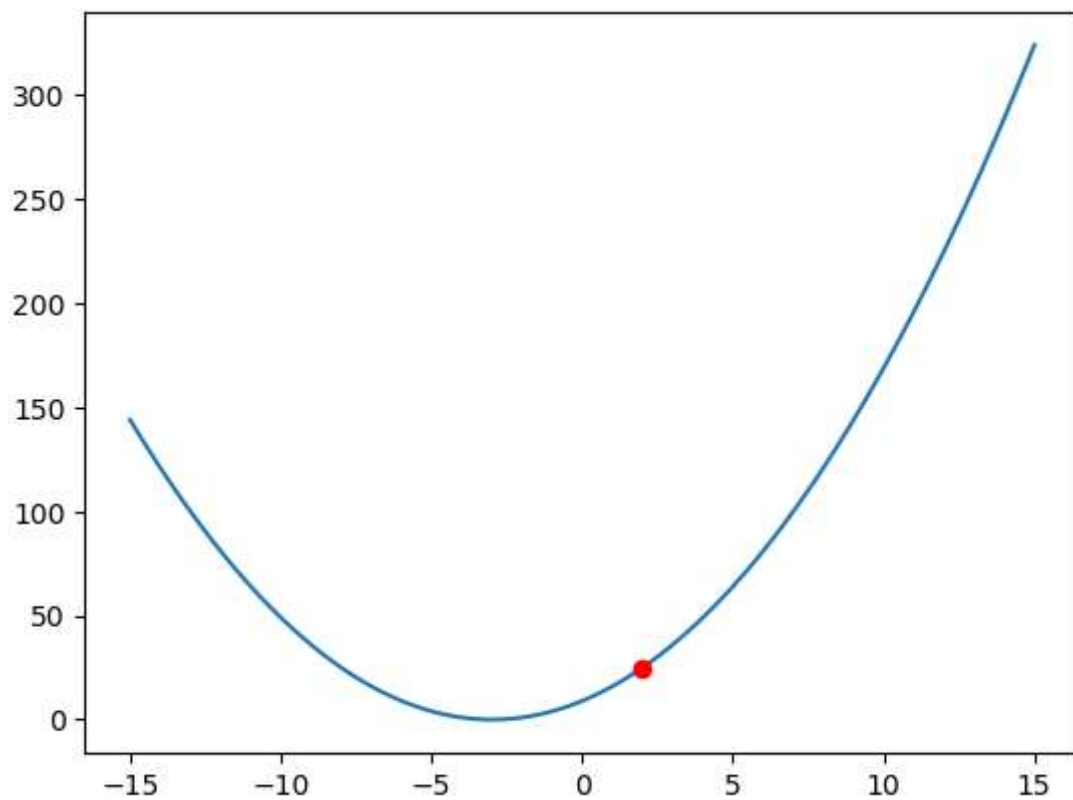
```
2.0*(x + 3)**1.0
```

Out[4]: 10.0

```
In [5]: alpha=0.1
        start=2
        max_iter=30
        x=sym.symbols('x')
        expr=(x+3)**2
```

```
In [6]: x_cor=np.linspace(-15,15,100)
        pyplot.plot(x_cor,objective(x_cor))
        pyplot.plot(2,objective(2),'ro')
```
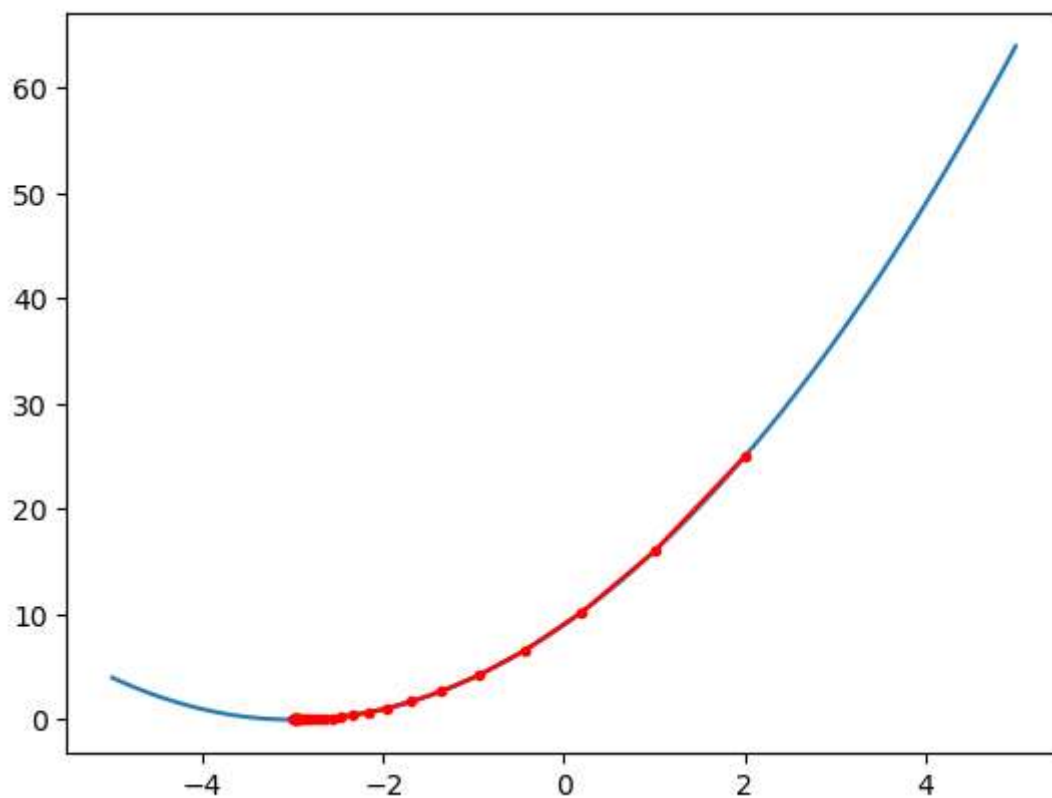
Out[6]: `[<matplotlib.lines.Line2D at 0x1b5c64bec70>]`

```
In [7]:  x=gradient(alpha,start,max_iter)
         x_cor=np.linspace(-5,5,100)
         pyplot.plot(x_cor,objective(x_cor))

         x_arr=np.array(x)
         pyplot.plot(x_arr,objective(x_arr),'.-',color='red')
         pyplot.show()
```

In [ ]: